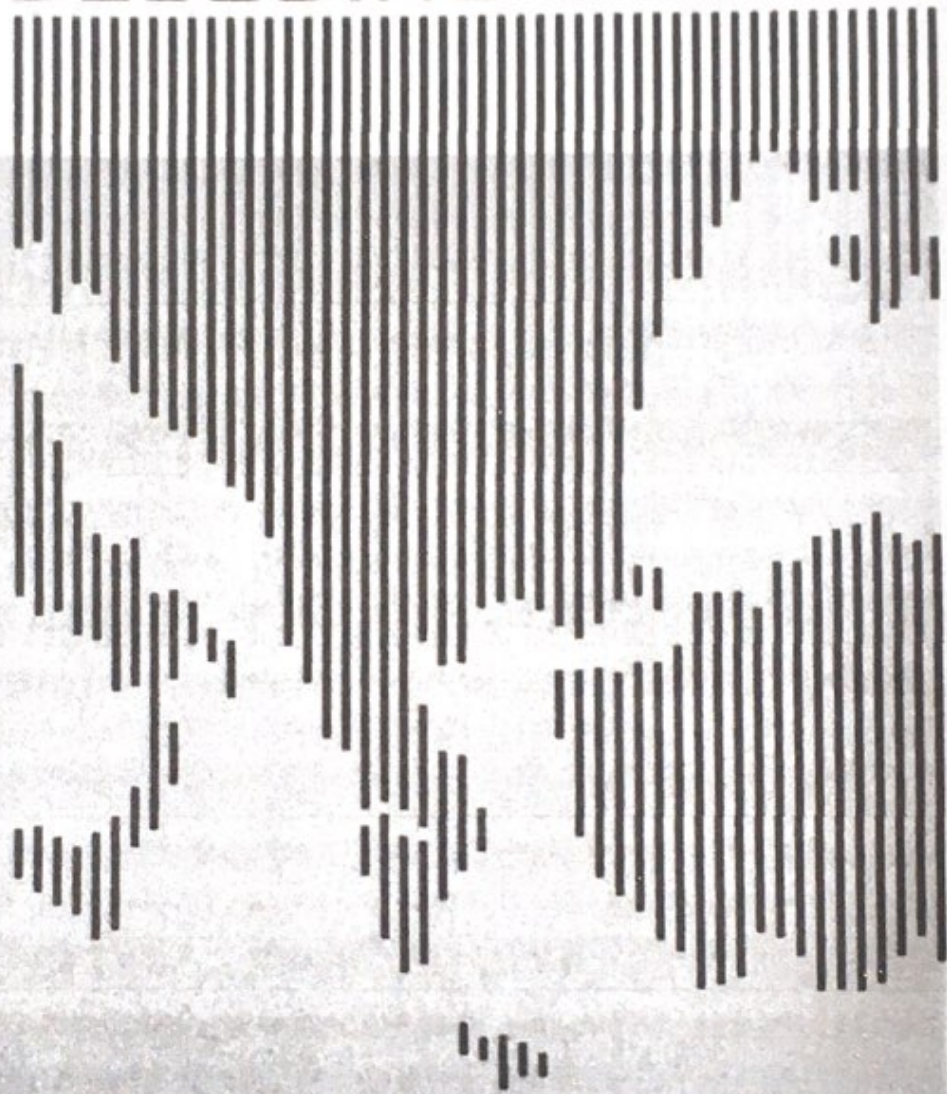


INTERNATIONAL CONFERENCE  
**DECODING BALKAN**



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Министарство образовања,  
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Balkan Architectural Biennale 2019  
Faculty of Architecture in Belgrade  
International Conference: Decoding Balkan

4<sup>th</sup> BAB INTERNATIONAL CONFERENCE

## **DECODING BALKAN: ARCHITECTURE, URBANISM, PLANNING**

Belgrade, 14-16<sup>th</sup> of November 2019.

Faculty of Architecture in Belgrade

Balkan Architectural Biennale - BAB

**INTERNATIONAL CONFERENCE: DECODING BALKAN – ARCHITECTURE, URBANISM, PLANNING**

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## NEW DIGITAL SYSTEMS FOR THE MANAGEMENT OF CULTURAL LANDSCAPES

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### I. INTRODUCTION

The research carried out concerned the relationships between the development of technologies and the history of Matera's cultural landscape. Key elements are the concepts of "cultural landscape" understood as a space in continuous construction that changes with the changing of the individual, collective, social and cultural relationships of the inhabitants of the territory, of "cultural inhabitant", that is a citizen producing culture more than a user, and vision of "future as an open place" in the sense of maximum usability and sharing of all human, material and immaterial productions through the use of technologies. In the light of the investigation it was found that Matera, a territory with a predominantly agricultural vocation, historically the site of complex social relations, has created a traditional rural society in which the concept of neighborhood as well as a spatial connotation also had the symbolic connotation of sharing knowledge and practices, relationships, but most of the inclusivity and sustainability. The use of 5G technology, of which Matera is the site of experimentation, is generating important cultural transformations; what in the past was in Matera the neighborhood community, now becomes a virtual community, where the sharing of knowledge and practices, beliefs and values, including the use and management of cultural heritage, takes place through the network with the use of applications that promote accessibility and sustainability. For future scenarios it can be assumed, according to this historical anthropological forecast, that in technology, with its extreme pervasiveness, will facilitate an even easier access to historic sites and pa cultural heritage, in harmony with the preservation of cultural heritage and to encourage the dissemination of cultural content for one of their own wider fruition.

Matera, as well as Basilicata and many Mediterranean areas has got a wide agricultural landscape which is deeply linked to its culture and inhabitants. So the focus of this research is also the employment of digital technologies for sustainable agriculture.

## 2. INNOVATION IN AGRICULTURE

In agricultural field it is necessary to link the increasing of production to sustainability and environmental protection policies – according to the protection of the natural heritage by reducing fertilizers, pesticides, fuel, as well as protecting forest resources from further tillage - without forgetting the dangerous phenomenon of depopulation of rural areas and management criticalities resulting from sudden climate change. The strong spatial and temporal variability that characterizes any agro-ecosystem has determined the need to identify new tools and strategies to achieve an efficient and effective management of agricultural lands. To do this it is necessary to have techniques and technologies capable of detecting the lack of homogeneity and, later, of applying the cultural inputs within the plot in a variable way.

The innovations connected to the world of agriculture so can be traced back to 3 fundamental themes

- Information collection and management
- Analysis of information in a decision-making perspective
- Operations automation

All of these fields can be better developed thanks to the most important technological trend of the moment, the 5G systems. They are born from the possibility of connecting objects and devices, even the most "unthinkable" ones. From sensors to monitor crop characteristics, to automatic guides, to drones useful for different purposes, from defense to land mapping.

With the technological endowment, available nowadays, the Internet of Things (IoT) realizes the connection between the physical objects, sensors and actuators and the connecting roads represented by the Internet.

So according to the continuous technological evolution, associated to the new EU and national regulations it has been developed a new management and business system: Precision Agriculture. So according to the continuous technological evolution, associated to the new EU and national regulations it has been developed a new management and business system that is object of experimentation in Matera: Precision Agriculture.

### 3. PRECISION AGRICULTURE IN MATERA: FIELD EXPERIMENTATION

In the most modern conformations, in perfect correspondence with the various emerging needs, the AdP is closely linked to geo-referencing systems, a process that allows you to permanently associate geographic coordinates with geometric-spatial information of various kinds and to new technologies as GIS, remote sensing and GPS.

Even modern agricultural machines are equipped with digital technology and are able to recognize the environment in which they operate.

Thanks to the monitoring by means of proximal and remote sensors, satellites, sensors on the machines, we are able to equip ourselves with software tools for storing geolocalized and vectored data, which allow us to have a spatial and punctual knowledge of the situation in the field.

The Variable rate, for example, based on maps and sensors can manage the variability generated by the environment in which the cultivation takes place applying chemical, mechanical and biological inputs in a strategic and diversified way combined to different methodologies with variable distribution (or variable rate).

Today the use of drones (UAVS) is also gaining more and more space and importance in the field of agriculture at all stages of production. The drone is therefore a device capable of mechanizing every stage of cultivation, eliminating the cost of human error and helping to maximize earnings and return on investment. GIS technology is also a fundamental technology useful to characterize the specific environment of development of the plant and its vegetative state and it is the common denominator of other components related to geospatial technologies, such as remote sensing and GPS.

The GIS Technologies give us the opportunity to manage a considerable amount of data related to the territory by placing them in relation to each other in order to allow to detect phenomena that otherwise could not be highlighted.

WebGIS for example, is a platform that is also characterized by the use of Geographic Information System (GIS) but whose functionalities are based on network technologies (WEB/Internet).

The Environment for Visualizing Images (ENVI) software is used to process and analyze hyperspectral and/or infrared geospatial images. It is used for remote sensing and for analyzing images. ENVI brings together a series of scientific algorithms for image processing, many of which are contained in an automated wizard-based approach that guide users through complex tasks.

The use of different spectral acquisition bands can be employed to identify more the types of soil or in general the substance or chemical element of interest or to detect their characteristic spectral signature discriminating it from the others.

The use of different spectral acquisition bands can be employed to identify more the types of soil or in general the substance or chemical element of interest or to detect their characteristic spectral signature discriminating it from the others.

The fields of use of this software are varied. Here are some of them:

- Vegetation classification and vegetative vigor of crops
- Classification of land use
- Crop nutritional and water stress monitoring

- Monitoring of weed infestation status
  - Monitoring of the phytosanitary status of crops
- With the technological endowment, available nowadays, the Internet of Things (IoT) realizes the connection between the physical objects, sensors and actuators and the connecting roads represented by the Internet.

#### 4. THE VARIABLE RATE

The variable application can be applied in all operations, starting from the tillage of the harvest, even if currently the machines that have developed faster are those related to the sowing and the mineral fertilizer.

With the same technological equipment it is also possible:

- To carry out working of the soil ;
- To distribute agro-drugs;
- To carry out defoliation practices;
- To distribute in a localized way the zootechnical waste;
- To start the identification of pathologies and weeds in the field

Computerized management of crops and livestock can lead to sensitive optimizations and productivity gains, also throwing the foundations for the full use of agri-robotics and drones.

A fundamental step in order to evaluate only the positive sides of this new agriculture is to work on the training of technicians for assistance. At the same time we must intervene on raising awareness of farms.

Another important innovative tool for agriculture is Block chain.

The blockchain (literally "block chain") is a shared, unchanging data structure a digital register whose entries are grouped in blocks, in chronological order, whose integrity is guaranteed by the use of encryption. It is similar to a distributed database, that is not centralized, managed by a network of nodes, each of which has a private copy. Therefore, due to these characteristics, it is considered an alternative in terms of security, reliability, transparency and costs to databases

The blockchain promotes transparency and visibility along the food chain. Cryptographic features on food source, quality, transit temperature and freshness can be used to ensure that data is real, accurate and truthful, instilling confidence and ensuring safety for both consumers and retailers.

Thanks to blockchain it is possible to obtain the traceability of a product in all the phases that characterize it from the raw material to the finished product.

Moreover a community recognizes itself within a landscape and the as IOT and Blockchain are tool for safeguard and enhancement not only of agricultural production, but also of the broader territory through the promotion and knowledge of these productions as a synthesis of culture, traditions, processes, raw materials and biodiversity, a cultural landscape as a set of indigenous elements of a site, components of an identity path that the man has enriched with his contribution without altering the identity profiles. Technologies also help the community to be more linked to its territory helping

people to be more conscious and more informed about their landscape and its history, so for their own culture.



Figure 1: Test in Matera based on prescription maps and 5G

## 5. CONCLUSIONS

Matera, is a virtuous example of the successful interaction between tradition and innovation because it is a city that held the primacy for the agricultural tradition and that is now preserved, lives, through the technological innovation in agriculture.

Matera is a city that held the primacy for the agricultural tradition and that is now preserved, lives, through the technological innovation in agriculture.

In Matera with the 5G what was the agricultural neighborhood in the years'50 now becomes digital neighborhood. Thereby, for future scenarios it can be assumed, according to this historical anthropological forecast, that technology, with its extreme pervasiveness, will facilitate the sharing of knowledge and practices, beliefs and values and actions, included safeguard and awareness on the agricultural landscape, can now be managed through the network and so promoting innovation and sustainability of production.



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